

NASA TECH BRIEF



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Design and Evaluation of Brushless Electrical Generators

As part of an analytical study of auxiliary electrical power systems, ten design manuals were assembled and nine computer programs were developed for evaluating proposed designs of brushless rotating electrical generators. The ten design manuals represent the results of an effort to assemble in one package the sum total of all information needed in the design of brushless rotating electrical generators. The nine computer programs permit calculation of the performance of specific designs including effects of materials. Both the design manuals and computer program listings are contained in the original report entitled "Brushless Rotating Electrical Generators For Space Power Systems," which consists of five volumes as listed in Note 2. The nine computer programs include:

1. Homopolar Inductor A-C Generator
2. Two Coil and Single Coil Outside Coil, Lundell A-C Generator
3. Salient-Pole Wound Pole Synchronous Generator Computer Program and Test Data
4. Generator Thermal Analysis
5. Non-Salient-Pole Wound Rotor Synchronous Generator
6. Rotating-Coil Lundell A-C Generator
7. Inside-Single-Coil, Stationary Coil Lundell A-C Generator
8. Inside, Two-Coil Stationary Coil Lundell A-C Generator
9. Permanent Magnet A-C Generator

Notes:

1. The computer programs were written for a 1620

computer. They have not been fully verified for accuracy and completeness.

2. The basic report of the original study, in five volumes, is available from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.65)

References:

NASA-CR-54320, Brushless Rotating
Electrical Generators for Space
Power Systems
N65-29717 - Topical Report Volume 1,
Selection Criteria
N65-30693 - Topical Report Volume 2,
Design Manuals
N65-30694 - Topical Report Volume 3,
Design Manuals
N65-30695 - Topical Report Volume 4,
Test Data & Computer Programs
N65-30696 - Topical Report Volume 5,
Appendix

Patent status:

No patent action is contemplated by NASA.

Source: J.N. Ellis and F.A. Collins of
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(LEW-10124)

Category 02

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1. The purpose of this report is to provide a summary of the results of the research conducted by the NASA Langley Research Center, Hampton, Virginia, in the area of the development of a new type of engine for use in the propulsion of spacecraft.

2. Description of the Engine and its Operation

The engine is a gas turbine engine of the type known as a "free turbine" engine. It consists of a compressor, a combustion chamber, and a turbine. The compressor is driven by the turbine, which is in turn driven by the combustion chamber. The combustion chamber is fueled by a liquid fuel, which is injected into the chamber and ignited. The combustion chamber is designed to operate at a pressure of 100 psia and a temperature of 2500°K.

The engine is designed to operate at a power output of 1000 hp and a fuel consumption rate of 100 lb/hr. It is capable of operating at a range of speeds from 1000 to 3000 rpm. The engine is designed to be used in a variety of applications, including as a power source for spacecraft, as a propulsion system for aircraft, and as a power source for industrial machinery.

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